

QB

801

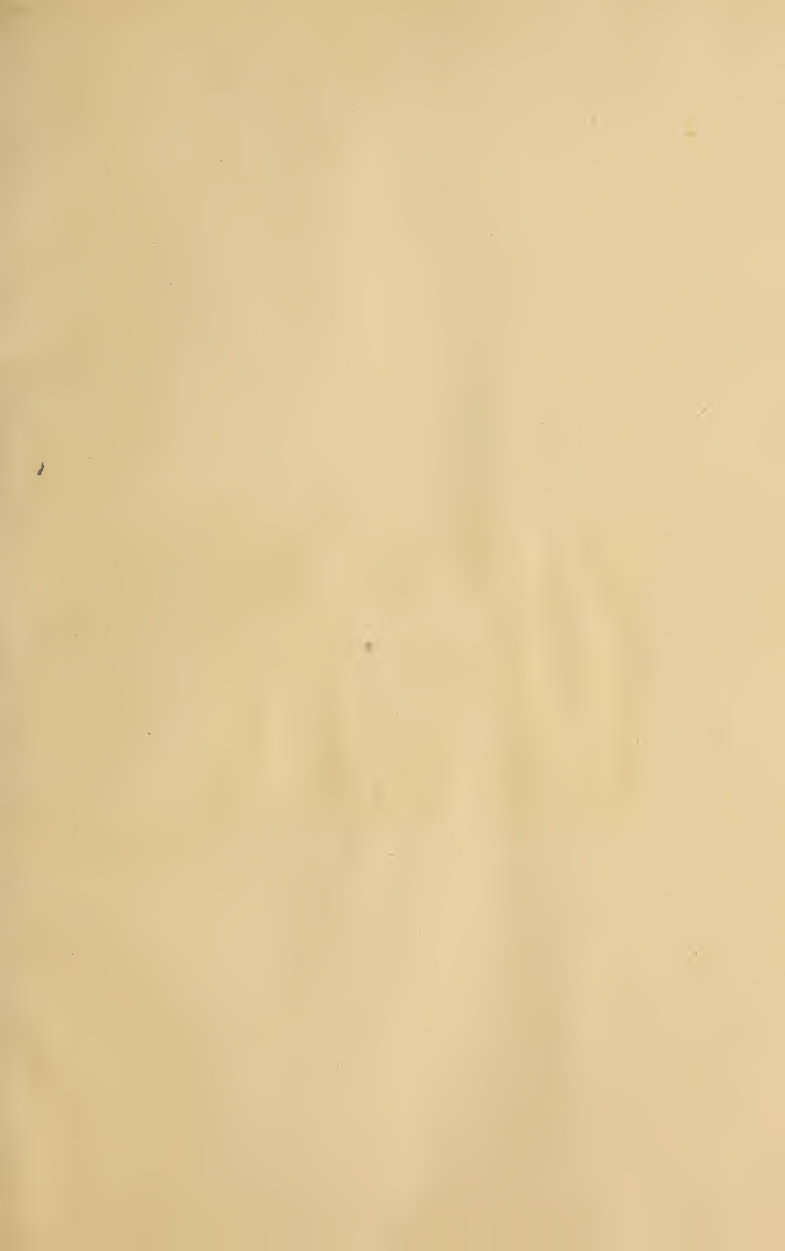
.W52

LIBRARY OF CONGRESS.

Chap. Q38 Copyright No.

Shelf W52

UNITED STATES OF AMERICA.



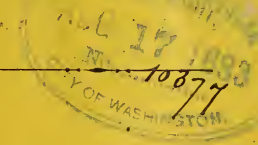
Home College Series.

Number ~~~~~ * ~~~~~ Twenty-Five.

THE STARS.

BY

REV. C. M. WESTLAKE, M.S.



NEW YORK:
PHILLIPS & HUNT.
CINCINNATI:
WALDEN & STOWE.

1883.

THE "HOME COLLEGE SERIES" will contain one hundred short papers on a wide range of subjects—biographical, historical, scientific, literary, domestic, political, and religious. Indeed, the religious tone will characterize all of them. They are written for every body—for all whose leisure is limited, but who desire to use the minutes for the enrichment of life.

These papers contain seeds from the best gardens in all the world of human knowledge, and if dropped wisely into good soil, will bring forth harvests of beauty and value.

They are for the young—especially for young people (and older people, too) who are out of the schools, who are full of "business" and "cares," who are in danger of reading nothing, or of reading a sensational literature that is worse than nothing.

One of these papers a week read over and over, thought and talked about at "odd times," will give in one year a vast fund of information, an intellectual quickening, worth even more than the mere knowledge acquired, a taste for solid reading, many hours of simple and wholesome pleasure, and ability to talk intelligently and helpfully to one's friends.

Pastors may organize "Home College" classes, or "Lyceum Reading Unions," or "Chautauqua Literary and Scientific Circles," and help the young people to read and think and talk and live to worthier purpose.

A young man may have his own little "college" all by himself, read this series of tracts one after the other, (there will soon be one hundred of them ready,) examine himself on them by the "Thought-Outline to Help the Memory," and thus gain knowledge, and, what is better, a *love* of knowledge.

And what a young man may do in this respect, a young woman, and both old men and old women, may do.

J. H. VINCENT.

NEW YORK, Jan., 1883.

THE STARS.

"The stars are the landmarks of the universe; and, amid the endless and complicated fluctuations of our system, seem placed by their Creator as guides and records, not merely to elevate our minds by the contemplation of what is vast, but to teach us to *direct our actions* by reference to what is immutable in his works."—*Sir John Herschel.*

"Survey this midnight scene:
What are earth's kingdoms to yon boundless orbs—
Of human souls, one day, the destined range?"

ASTRONOMY, as its name signifies, is a setting forth of the laws of the stars; but in its more extended application it comprehends the constitution, motions, and appearances of all the heavenly bodies. This science, as we find it to-day, has been the work of centuries.

*Astronomy as
a science.*

Its general laws and principles rest upon certain basal facts, many of which were the common property of the most ancient nations, yet, indeed, until comparatively recent times, the knowledge of celestial phenomena and laws was exceedingly fragmentary, containing, it is true, the germs of a future, but as yet undeveloped, science. With the discovery, improvement, and use of its instruments, astronomy, as a science, has attained to a most royal dignity. In that department of this science occupied by the stars, we find that no recollection of facts pertaining to our solar system is out of place. There is scarcely a feature of our recently acquired knowledge of this system but what may be attributed, on an inconceivably grander scale, to the stellar universe. Every thought of variety, vitality, development, and the infinities of time and space, suggested by our study of the sun and planets, is a step upward and nearer that higher plane of thought, among

*The place in
this science oc-
cupied by the
stars.*

the stars, where we so consciously contemplate and irresistibly perceive Infinitude, Eternity, and Omnipotence, that it is impossible to ignore the reality of their existence or to

The stars declare a wisdom and power superior to the wonders of time and space.

evade their significance. We are conscious of an omnipresent, unifying, and irresistible Power, making such disposition of innumerable worlds through illimitable space that an enforced, ordered, beautifully consistent, and beneficent purpose is everywhere manifest. There comes to us, from this combined harmony and co-operation of the different parts of the universe, the suggestion of a common center—"the throne of nature, the footstool of divinity"—from which system after system, in countless numbers and widely and immeasurably distant from each other, stretch outward in every direction, with nowhere disorder or confusion obtaining against the whole or any of its parts. As we seek to compass the thought, not only of a central, but of a *personal*, Power, reigning supreme and absolute in, throughout, and over all, we are convinced that his living presence is every-where, and his supreme authority is felt in every soul. Well may the morning stars sing for joy at the work of God's creative energy, and all the infinite host of heaven continually declare his glory! And yet this universe contains but "the hiding of his power." He is veiled, in sacred and impenetrable majesty, by the unfathomable depths of starry worlds, the immeasurable reaches of space, and the towering heights of eternity. Though concealed, he is none the less present in all his works. The limitations of our position no more argue uncertainty or unconsciousness of the existence and presence of an invisible and incomprehensible God, than they do of those outlying regions of the universe which we can neither determine nor explore. Man, in his more felicitous moods, is conscious of mental powers, even here and now, far superior to all his physical surroundings. To explore the material universe, fathom its depths, and scale its heights, he needs

but the means adequate to his capacity. By parity of reason this is equally true in the spiritual realm. Therefore, the blossoms and rich fruitage of this royal science should speak to man's spirit of the possibilities reserved for it in the infinitely more glorious paradise of God.

THE VASTNESS OF THE STARRY FIRMAMENT.

Science has so far sounded the depths of the material universe as to satisfy us that stars and nebulae are interminably scattered through all penetrable space. The number of stars usually visible to the naked eye, in The stars innumerable. the whole heavens of the northern and southern hemispheres, is between five and eight thousand. This number, in the most powerful telescopes, is increased to between forty and fifty millions, or about six or eight thousand to every one visible to the naked eye. We have also good reason for believing that still larger and correspondingly perfect instruments would reveal millions upon millions more of smaller or more distant stars. What we see is probably but an infinitesimal part of the great universe, which stretches far, far beyond instrumental observation and analysis. This fact serves to increase the difficulty realized in attempting to estimate the magnitude, or form, or scale on which the universe is constructed. Only limited success in this direction has attended the most careful observations and refined calculations of recent times. However, this degree of success is sufficient to justify us in fixing upon certain figures as the approximate distances of the visible stars, and to give us, at least, a crude idea of the shape and magnitude of the visible universe. The stars are so distant that, under the The distance of the stars. most powerful telescopes, they continue to appear as brilliant points of light, with no sensible diameter. Even when viewed from stations on opposite sides of the earth, or eight thousand miles apart, they suffer no displacement, but appear in the same relative position at both points. It is

evident, the earth's diameter is too small a base line from which to ascertain the distance of the stars; but if we take the extreme points of the earth's orbit—a hundred and eighty-five million miles apart—with the most careful and exact measurement, a slight displacement is observed in the case of twelve particular stars, from which their actual, though greatly differing, distances have been ascertained. Alpha Centauri, a bright star in the southern hemisphere, near the celebrated Southern Cross, is, so far as known, the nearest fixed star, being about twenty-one billion miles distant. It is 226,400 times farther from us than our sun, whose light reaches us in about eight minutes, while its light requires three and a half years. The light of Sirius travels such an immense distance that it is sixteen years in coming to us, and that of the Pole Star over forty years. Other stars are so far distant that the light we receive from them had been on the way thousands of years before it touched our planet.

If it is true, as is most probable, that the difference in brilliancy is due mainly to the difference in distance, then we may conclude that the apparently smallest telescopic stars are at such immense distances from us that light, to traverse the intervening space, requires upward of forty thousand years. The stars visible to the naked eye are The stars of the Milky Way. seemingly scattered at random throughout the whole heavens, though many times thicker in some regions than in others. Of the telescopic stars many are aggregated in close clusters, some of which lie within, and some without, the Milky Way. It is in the Milky Way we find, scattered in irregular aggregations, by far the greater number of these stars.

The Milky Way is a beautiful stream of pale light, irregular in outline and dividing the heavens, as by a great circle, into two nearly equal parts. This stream separates into two branches for a considerable portion of its course. It has various vacant spaces, but at only one point in the southern

hemisphere, called the "Coal Sack," is it entirely interrupted. Milton speaks of it as the "broad and ample road, whose dust is gold and pavement stars." It has been known among various nations as the "Galaxy," the "Circle of milk," and the "Celestial river." Some of our American Indians held it to be the "path of the dead to the happy hunting-grounds." The English speak of it as "Jacob's ladder." "Different opinions prevailed among the ancients as to what it was. Aristotle thought that it was the result of gaseous exhalations from the earth, set on fire in the sky. Theophrastus believed it to be the soldering together of two hemispheres, constituting the celestial vault. Diodorus represented it as a dense celestial fire, appearing through the clefts of parting hemispheres. Democritus and Pythagoras divined the truth, that the Galaxy is nothing more nor less than a vast assemblage of very distant stars; and Ovid speaks of it as a highway whose groundwork is of stars."

The telescope shows that the Milky Way arises from the light of *nebulæ* and of innumerable stars. In this great circle round us the stars seem to extend almost to infinity; but in other directions they speedily come to an end, where, as if in compensation, the *nebulæ* increase. Real *nebulæ*, in the spectroscope, are found to be enormous masses of incandescent gas, generally hydrogen or nitrogen, and, contrary to the general distribution of the telescopic stars, these cloud-like patches of light increase in number with the increase of distance from the Milky Way. The continuous spectrum of such inconceivably remote *nebulæ* as that of Andromeda indicates solid matter which, doubtless, under sufficiently high telescopic power, would be resolved into a system of stars. Other *nebulæ* have been quite frequently developed, by powerful telescopes, into distinct star-clusters. It is possible that many of the more distant *nebulæ*, having a continuous spectrum, may be such systems as that of the Milky Way, though the visible star-clusters cannot compare with it in

numbers or magnitude. In a space of twenty degrees long and fifteen degrees wide of the Milky Way, Sir William Herschel, by aid of a powerful telescope, once counted fifty thousand stars. While in some parts of the Milky Way the space-penetrating power of the telescope has passed through its dense congregation of stars to a non-luminous background beyond, yet in many instances the highest optical power has only disclosed behind the revealed stars a pale luminosity which the tasimeter declares to be from an impenetrable galaxy of stars. Sir William Herschel made some very interesting observations of the Milky Way near its thinnest and least luminous parts, at a point in the sword-hilt of Perseus, in the constellation of that name. Here the unaided eye sees nothing ; but with a small telescope numerous stars are visible, and with increased power bright spots and nebulous haze fill up the background. In Sir William Herschel's great telescope this region teemed with multitudes of magnificent suns ; but clear through and beyond their brilliant and sparkling light the instrument penetrated into that solemn and sable background of night, free from nebulae, and without the faintest light to soften its deep intensity. In doing this, his vision passed by five hundred suns ranged in perspective one behind the other, at distances, each from each, not less than that of Alpha Centauri from our sun. But the majesty and vastness of this revelation are far surpassed by those of the thickest portions of this galaxy, where the most powerful instruments of to-day fail to fathom the depths of its profound and ever-receding luster. "Here a stratum of five hundred star systems in depth would be lost, like so many atoms of sand on the immensity of an ocean shore. They might be blotted out, and the most careful observer, with the finest instrument, would not miss them. They might be rekindled, and all their sun-bursts united would not add an appreciable glimmer to the pale luster of the steadfast background." Thus, with marvelous optical

power, from an observatory which it has taken three thousand years to construct, man sweeps the heavens in vain for the boundaries of the universe. His plummet line of one hundred and eighty-five millions of miles re-duplicates itself again and again, but to be lost in the depths of space. Beyond its farthest reach there are yet fathomless abysses, lit up by starry worlds. He may count the sands of the seashore, but he cannot tell the stars for multitude. He may take up our solar system as a very little thing, but what scale of weights and measurement shall he use for the stellar universe? Assuredly the unexcelled achievements of astronomical science have compassed but "a step in infinitude—a fragment of the eternity of space and power."

VARIETY OF MOTION IN THE STARRY FIRMAMENT.

The real motion of the earth from west to east gives to the stars an apparent motion from east to west. Besides this apparent, they also have a real, or The proper motion of the stars. proper, motion. This latter motion, at such an immense distance from us, is relatively minute. A railway train going at the rate of thirty miles an hour, when seen a great way off, appears to stand still. The real motion of the stars can be detected only with the most delicate instruments, by a series of observations extending through a great many years. Yet the actual velocity of this motion averages from twenty to fifty miles per second, while the maximum velocity almost exceeds belief. Arcturus moves at a rate of speed one hundred times faster than an ordinary railway train. The star known as 1830 Groombridge, of the constellation of the Hunting Dogs, has a velocity of two hundred miles per second. It has been said, "By the year 9000 it may be in Bernice's Hair." This velocity is greater than all the known matter in the universe could produce by its combined attraction, and therefore cannot be accounted for solely on the theory of gravitation.

The stars are not seemingly greatly affected by mutual attraction, and yet there is strong presumptive evidence that the stellar universe not only can, but does, revolve about a common center. Single stars have been resolved

Motion of
double and
multiple stars.

by the aid of the telescope into three or more, called multiple stars, revolving around a common center. When a single star appears in the field of the telescope as two stars it is called a binary system, or physical couple, to distinguish it from an optical couple, which appears as such simply from two stars lying in the same straight line as seen from the earth. Upward of six thousand physical couples, or double stars, are now known. In the case of nearly seven hundred a common center of gravity has been observed, which indicates connected systems. Of triple stars, an instance is known of two stars revolving in elliptical orbits about the third. The star Epsilon, in the constellation Lyrae, appears to the naked eye as a faint single point of light. A powerful instrument reveals a system of four stars, called the "Double-Double." The two stars of each pair describe orbits round a center of gravity between them, and the two pairs, considered as two single stars, describe immensely wider orbits round their common center of gravity. The former revolutions require about two thousand years, and the latter about one million of

Motion of the
stars as a uni-
verse.

years. Inconceivably greater must be the length of time required for a single revolution of the universe about a common center. It is claimed that Madler's view, that Alcyone of the Pleiades is the central sun of the universe, is "a piece of groundless speculation;" but a central sun of suns is not necessary to the theory of unification by gravity. "Two suns can balance about a point; all suns can swing about a common center. That one unmoving center may be that city more gorgeous than eastern imagination ever conceived, whose pavement is transparent gold, whose walls are precious stones, whose light is life,

and where no dark planetary bodies ever cast shadows"—the central abode of the Divine Originator, who made, and by whom is poised and controlled in orderly arrangement, this complex and boundless universe of worlds.

In crossing an open field, from one wooded portion to another, the trees appear to be drawing together in the woods we are leaving, and to be separating wider and wider apart in the one to which we are going. The stars in the constellation of Argo appear to be grouping closer together; while in the opposite quarter of the heavens the stars in the constellation of Hercules appear to be drawing away from each other. Our sun, with all his attendant planets, is moving in the direction of Hercules at the rate of four miles a second.

The motion of particular stars, and possible results.

Aside from this motion, the telespectroscope shows that certain stars in the line of sight are moving from, and others toward, our solar system. As a general rule, stars found in the same region of space move nearly in the same direction. An exception to this rule is the phenomenon to which Proctor gives the name Star-drift. Five out of seven of the stars which form the Great Dipper constitute such a group, with a community of motion or drift in the direction of the star Thuban. Warren says: "In thirty-six hundred years the end of the Dipper will have fallen out so that it will hold no water, and the handle will be broken square off at Mizar." "The Southern Cross," says Humboldt, "will not always keep its characteristic form, for its four stars travel in different directions with unequal velocities. At the present time it is not known how many myriads of years must elapse before its entire dislocation."

NO EVIDENCE OF GROWTH OR DECAY IN THE STARRY FIRMAMENT.

Thus far no loss or increase to the stellar universe has been positively known. We are not certain in any single

instance of the disappearance of a star, or of the appearance of a new one. It is true, certain stars appear or disappear in the heavens ; but other stars, which do not disappear, experience a periodical or irregular increase and diminution of brightness. Therefore, so-called new and lost stars probably owe such designations to extreme variations in the quantity of their light. Indeed, several instances are on record of a small star, invisible to the naked eye, flashing out into brilliancy, and, after a time, sinking into its former condition. Kepler has written an interesting history of a new or rather temporary star seen by him in 1604. It was remarkable for its beautiful scintillation and rainbow colors. It is supposed to have appeared in 393, 798, and 1203. A bright star in Cassiopeia, seen by Tycho Brahe in 1572, is supposed to have showed itself, in almost exactly the same place, in 945 and 1264. A star is now seen in the same part of the heavens, slowly increasing in brightness, and will probably rival Venus in splendor, about 1885.

Temporary stars. Probably one out of every forty stars are of variable brilliancy. In general the variations are so slight that only the most skilled observers, by continued examinations with delicate instruments, can detect them ; but in a few instances they are obvious to all who will take the pains to watch for them. Eta, in the constellation Argo, is, perhaps, the most extraordinary of the variable stars, and may be regarded as a connecting link between them and temporary stars. In March of 1843 it was second only to Sirius, the brightest star in the heavens. It diminished in brightness for twenty-five years, and in 1868 it vanished from the unassisted view, and has not yet begun to recover its brightness. Mira, the wonderful star, for fifteen days of its period of eleven months, is almost as brilliant as a second magnitude star ; but it fades away till it becomes invisible to telescopes of small power. The variable star, Algol, is remarkable for its short period of a few days. This variability has

been supposed to indicate a partial eclipse, occasioned by a large dark planet. Again, it has been asserted the star revolves on its axis, and presents unequally luminous parts. The latest and most probable theory of variable and temporary stars has been deduced by Balfour Stewart, from observations of the variability of the sun. We have good reason to believe that the physical constitution of the stars is of the same general nature as that of the sun. Constitution of the stars. The stellar spectra indicates solar elements with characteristic modifications, from differences of temperature as well as of combination. Every eleven years, or at the period of the greatest number of sun spots, we get the least light from the sun, and when freest from these the light is brightest. Suppose a similar mode of operation for stellar as for solar forces, subject to the differences in distance, size, and temperature, and we have, perhaps, the true theory for the changes in brightness of the variable and temporary stars. The spectrum of the temporary star of 1866 indicated a sudden outburst of hydrogen gas, similar to what is seen in the red flames of the solar chromosphere, only on an immensely grander scale, as the cause of its extraordinary increase of brightness. This gas may have been liberated from within, or produced by the force of its impact with a planet, or with some other star. "It is far more likely," says Warren, "that this star encountered an enormous stream of meteoric bodies, or, perhaps, absorbed a whole comet, that laid its million leagues of tail as fuel on the central fire." Besides variation in brilliancy, stars have been known to change color. Stars of different colors. The white star Sirius at one time was red. Iron, in a furnace, passes from a dull red at low temperature through different colors to a white heat. Sirius, Regulus Vega, and Spica are at white heat. Procyon, Capella, and Polaris are yellow, from a lower temperature. Aldebaran and Betelguese give only red light.

Possibly, difference in atmosphere, age, etc., has something

to do with this variety of color. This variation is one of the most remarkable features of the multiple stars. A certain ternary combination shows a rich and full orange star, with two fainter green stars. Sometimes one star of a binary system is a bright blue, and the other a sea-green; and sometimes a white star is combined with a red star. With a certain bright star is to be seen an intensely clear crimson star. More than three hundred red stars have been catalogued, having every tint and delicate gradation known to a discriminating eye. A celebrated cluster in the Southern Cross, containing over one hundred small stars, appears in the larger telescopes, sparkling and flashing in all the tints of green, blue, and red, "like a superb piece of fancy jewelry." What a wonderland of colors must be a planet of the Multiple Star System! We can imagine how "Mountain peak and running water will be smitten into ruby and amber and amethyst and violet, or dashed into a sudden spectrum of opal, or quickened with the colored and swift-passing flash of the diamond, as the lights and shadows troop through the changeful sky." It is a degree of magnificence far surpassing the most glowing fancies and wonder-filled creations of fairy land.

CONSTELLATIONS IN THE STARRY FIRMAMENT.

Some of the principal stars have names assigned to them, but it would be impossible to designate each star by a particular name. Hence, for the sake of convenience, the stars have been divided into groups, called constellations. These number one hundred and six, of which forty-eight were known to the ancients, who divided them into twelve zodiacal constellations, twenty-one of the northern and fifteen of the southern hemisphere. Orion, the Pleiades, and the Great Bear were known from the most remote antiquity. Certain constellations are symbolized by the figures of birds, fishes, men, and monsters. In nearly every instance, however, there is little or no resemblance between the outline of

the group and its symbol. It is probable the original diagrams accurately recording the positions of the stars were, in the decadence of monotheism, distorted by a guilty superstition into the horrid monsters of sin-polluted imaginations. But the ancients did not people the heavens with "gorgons, hydras, and chimeras dire" alone. They also gave to their embodiments of hope and highest ideals a place of ceaseless activity and dominion in the skies. The constellation of Hercules continues in perpetual memory the efforts in behalf of others of a half-divine hero of that name, who won for himself the right to shine in light forever. The equally heroic, but more poetic, life of Perseus, is written in the starry syllables of the constellation which bears his name. Equipped by the gods for the defense of unprotected innocence and virtue, and the destruction of its monster assailant, he first attacks and cuts off the head of the loathsome Gorgon Medusa, whose horrid aspect of snaky hair and scaly body was wont to turn to stone every beholder. As he swept through the air on the sandals of Mercury, carrying the head aloft, the blood which dropped from it upon the sands of Lybia turned into serpents. He came to where the maiden was chained to a rock as a tribute to a sea-monster, which he speedily slew. He rescued Andromeda from a horrible fate, and led her away "by the bands of love." "To the ancients the heavens were full of fighting Orions, wild bulls, chained Andromedas, and devouring sea-monsters. Our heavens are significant of harmony and unity; all worlds carried by one force and harmonized into perfect music." We have rejected the fables and superstitions of an earlier age, and in that system of worlds, "connected by a force so fine that it seems to pass out of the realm of the natural into the spiritual," we find shining steps, which we most reverently climb, in the ever-ascending way to the infinite Creator. "Lift up your eyes on high, and behold who hath created these things, that"

Origin and significance of the ancient constellations.

brought "out their host by number : he calleth them all by names by the greatness of his might, for that he is strong in power; not one faileth."

THE EARTH CHANGES, BUT NOT THE STARRY FIRMAMENT.

The great star-book of the skies contains the beautiful lesson of harmony and constancy. Earthly fluctuations do not invade the serene and unchanging heavens. To-day the axis of the earth points within a few degrees of the star Polaris; 2300 B.C. it pointed much nearer than that to Thuban, which was then the Pole Star. In 21,200 years from now it

The stars constant. will again point toward Thuban. Polaris, Vega,

Thuban, and a few other stars forever sustain between them the honor of sentinel service for the eternal throne of the North. Arcturus and his sons, as in the days of Job, continue their solemn march around the pole. Orion, girt with his band of light, yet climbs the steep ascent of the eastern sky. "The sweet influences of the Pleiades are still unbound. The signs and seasons are still numbered upon the glittering belt of Mazzaroth."

From age to age the stars endure, with no diminution of light, no break in their harmony, no change of place—ever poised, maintained, and marshaled in perfect order, by an

The earth changeable. invisible and almighty hand. The unchanging

order of the heavenly host finds no counterpart on the earth. Kingdoms rise and fall amid the surge of human passion and the shock and cloud of battle. Nation after nation, like ephemeral forms, disappear on the ocean of life. The flood of ages has repeatedly swept out and swept in new orders of things. The ocean's fury of wind and wave, the throbbings of the volcano's fiery heart, the earthquake's shock and the tornado's wrath, each in their turn and together have contributed to the disorder and calamities of this groaning habitation of man. "The clouds and tempests of earth have not dimmed the light of the stars. The shock

of armies and the thunder of a thousand battles have not shaken one gem from the diadem of night." God's firmament, with its starry worlds, still knows his never-failing vigilance, and is maintained, as in the beginning, by his unaided hand. The Psalmist witnessed the glory of God in the heavens; but the great telescope of to-day reveals one hundred and twenty-seven millions such heavens as he saw. Immensity of space, all ablaze with God's glory, inspires the question, "What is man that thou art mindful of him?"

"We for whose sake all nature stands,
And stars their courses move."

"We, for whom God the Son came down,
And labored for our good."

With more than an earthly parent's love, God cares for us, and holds these worlds in but light esteem compared with a human soul. Not only at Christmas time—the season of immortal hope and the birthday of immortal mercy—and on joyous Easter-day, which we love for what it makes us forget and for what it makes us remember; but on every occasion of joy and of sorrow, of darkness and of light, we may read evidences of God's wisdom, might, and loving solicitude for his children on every page of his holy Book, where *every syllable is a star*. It is but a natural and pleasant step from the starry firmament above to the starry firmament of revelation in which we behold the world's Redeemer, conflict-scarred, rainbow-covered, and glory-crowned, sitting at the right hand of the Majesty on high; having made possible for us a purity whiter than snow, a knowledge wider than an angel's, heights of character loftier than the stars, and with foundations deeper than the abysses of space.

As "between two worlds life hovers like a star," it is not in vain that we stretch out our hands imploringly and make our cry to God,

"For yet I know, past all doubting truly
A knowledge greater than grief can dim;
I know, as he loved me, he will love me duly,
Yea, better, e'en better than I love him."

"Is not God in the height of heaven? and behold the height of the stars, how high they are!"—BIBLE.

"That man who never looked up, with serious attention, to the motions and arrangements of the heavenly orbs, must be inspired with but a slender degree of reverence for the Almighty Creator, and devoid of taste for enjoying the beautiful and the sublime."—DR. DICK.

"There they stand, shining in order, like a living hymn, written in light."—N. P. WILLIS.

"One star differeth from another star in glory."—BIBLE.

"I wonder as I gaze. That stream of light,
Undimmed, unquenched—just as I see it now—
Has issued from those dazzling points, through years
That go far back into eternity.
Exhaustless flood! forever spent, renewed forever!"

"Stars teach as well as shine."

"For many years it has been one of my constant regrets that no school-master of mine had a knowledge of natural history, so far, at least, as to have taught me the grasses that grow by the wayside, and the little winged and wingless neighbors that are continually meeting me with a salutation which I cannot answer, as things are. Why didn't somebody teach me the constellations, too, and make me at home in the starry heavens, which are always overhead, and which I don't half know to this day."—CARLYLE.

"'Tis not for me, ye heavens! 'tis not for me
To fling a poem like a comet out, far splendoring
The sleepy realms of night."—ALEXANDER SMITH.

THE STARS.

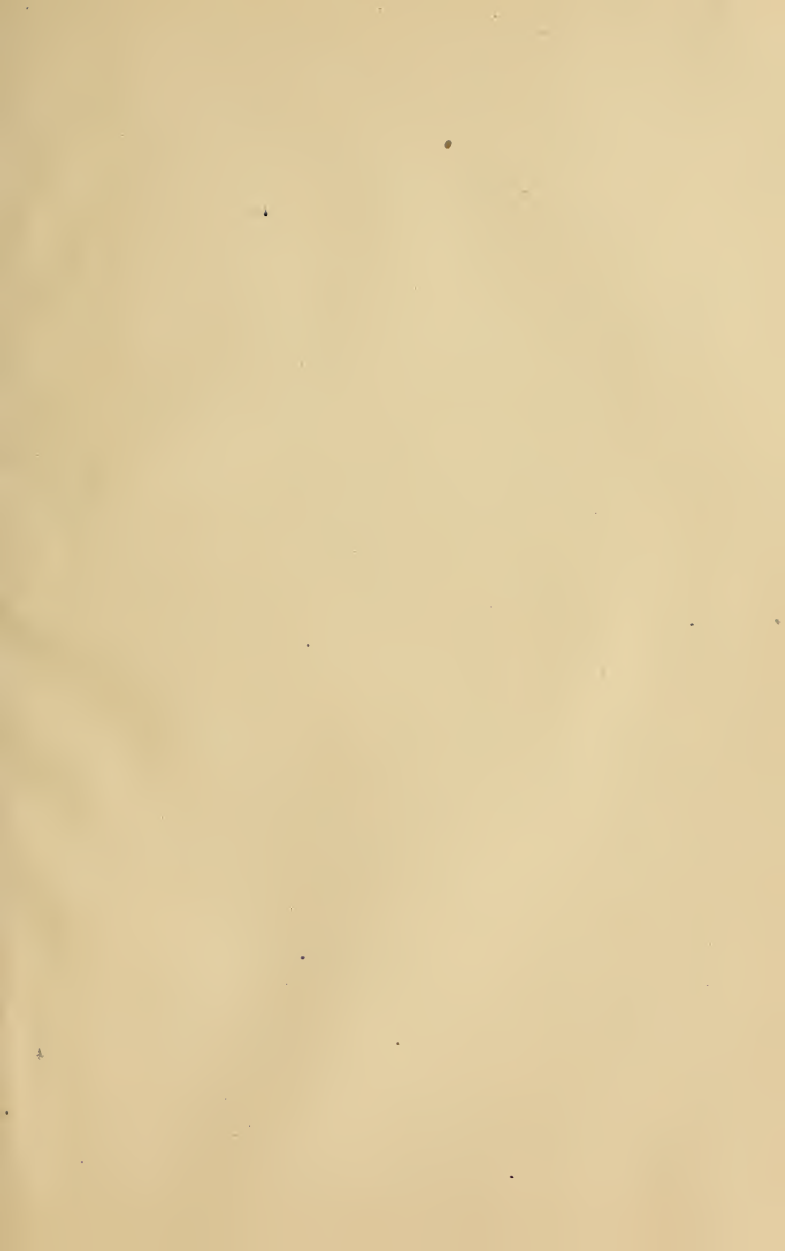
[THOUGHT-OUTLINE TO HELP THE MEMORY.]

1. What is Astronomy? Signs of a Creator? Number of stars visible to naked eye? Through telescopes? Distance of stars? Alpha? Sirius? Pole Star?
2. Milky Way? Different names? Different theories? Herschel's observations?
3. Apparent motion of stars? Real motion? Arcturus? Groombridge?
"Multiple stars?" Epsilon? "Star-drift?"
4. Decay in the starry firmament? Eta? Mira? Balfour Stewart's theory?
Variety of color?
5. Constellations? Changes on earth?

CHAUTAUQUA TEXT-BOOKS.

	CENTS.		CENTS.
No. 1. Biblical Exploration. A Condensed Manual on How to Study the Bible. By J. H. Vincent, D.D. Full and rich.....	10	No. 19. The Book of Books. By J. M. Freeman, D.D.....	10
No. 2. Studies of the Stars. A Pocket Guide to the Science of Astronomy. By H. W. Warren, D.D.....	10	No. 20. The Chautauqua Hand-Book. By J. H. Vincent, D.D.....	10
No. 3. Bible Studies for Little People. By Rev. B. T. Vincent.....	10	No. 21. American History. By J. L. Hurlbut, A.M.....	10
No. 4. English History. By J. H. Vincent, D.D.....	10	No. 22. Biblical Biology. By Rev. J. H. Wythe, A.M., M.D.....	10
No. 5. Greek History. By J. H. Vincent, D.D.....	10	No. 23. English Literature. By Prof. J. H. Gilmore.....	20
No. 6. Greek Literature. By A. D. Vail, D.D.....	20	No. 24. Canadian History. By James L. Hughes.....	10
No. 7. Memorial Days of the Chautauqua Literary and Scientific Circle.....	10	No. 25. Self-Education. By Joseph Alden, D.D., LL.D.....	10
No. 8. What Noted Men Think of the Bible. By L. T. Townsend, D.D.....	10	No. 26. The Tabernacle. By Rev. John C. Hill.....	10
No. 9. William Cullen Bryant.....	10	No. 27. Readings from Ancient Classics.	10
No. 10. What is Education? By Wm. F. Phelps, A.M.....	10	No. 28. Manners and Customs of Bible Times. By J. M. Freeman, D.D.....	10
No. 11. Socrates. By Prof. W. F. Phelps, A.M.....	10	No. 29. Man's Antiquity and Language. By M. S. Terry, D.D.....	10
No. 12. Pestalozzi. By Prof. W. F. Phelps, A.M.....	10	No. 30. The World of Missions. By Henry K. Carroll.....	10
No. 13. Anglo-Saxon. By Prof. Albert S. Cook.....	20	No. 31. What Noted Men Think of Christ. By L. T. Townsend, D.D.....	10
No. 14. Horace Mann. By Prof. Wm. F. Phelps, A.M.....	10	No. 32. A Brief Outline of the History of Art. By Miss Julia B. De Forest.....	10
No. 15. Froebel. By Prof. Wm. F. Phelps, A.M.....	10	No. 33. Elihu Burritt: "The Learned Blacksmith." By Charles Northend.	10
No. 16. Roman History. By J. H. Vincent, D.D.....	10	No. 34. Asiatic History: China, Corea, Japan. By Rev. Wm. Elliot Griffiths.....	16
No. 17. Roger Ascham and John Sturm. Glimpses of Education in the Sixteenth Century. By Prof. Wm. F. Phelps, A.M.....	10	No. 35. Outlines of General History. By J. H. Vincent, D.D.....	10
No. 18. Christian Evidences. By J. H. Vincent, D.D.....	10	No. 36. Assembly Bible Outlines. By J. H. Vincent, D.D.....	10
		No. 37. Assembly Normal Outlines. By J. H. Vincent, D.D.....	10
		No. 38. The Life of Christ. By Rev. J. L. Hurlbut, M.A.....	10
		No. 39. The Sunday-School Normal Class. By J. H. Vincent, D.D.....	10

Published by PHILLIPS & HUNT, 805 Broadway, New York.



LIBRARY OF CONGRESS



0 003 598 035 0